

CHAPTER

IX

VERY HIGH FREQUENCY

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HISTORICAL REPORT
V. H. F.

The following report is submitted covering the various phases of the VHF equipments:

Phase No. 1 - Research and Development.

Phase No. 2 - Procurement.

Phase No. 3 - Installation.

Phase No. 4 - General Description of VHF Equipment.

Phase No. 5 - Tactical and Technical Operation.

Phase No. 1 - RESEARCH AND DEVELOPMENT.

1. The authority for the development of this equipment was in accordance with 1st Indorsement, OCSigO 413.44 SCS-552 on letter FM(SCL) 319.1 dated 5/14/41. This authority was for the Research and Development of ground station communication and direction finding equipment used for interceptor flight control (Frequency Range 100-156 megacycles). This also included the preparation of specifications for Control Net System SCS-2, SCS-3 and SCS-4. Project 12-5.1 was assigned to cover the development of communications equipment for ground control of intercept pursuit operations (CEGCIP). This equipment is the American equivalent of the British VHF equipment.

2. A model of the British VHF equipment was shipped to this Laboratory in April 1941. This equipment was loaned to Bendix Radio, Division of Bendix Aviation Corporation in June 1941 to be used as a model in producing the American counterpart of British VHF equipment. The same equipment was forwarded to the Commandant of the Orlando Air Base, Orlando, Florida in March 1942. Interchangeable tests between the British VHF equipment and the American CEGCIP equipment were made at that Air Base during April and May 1942. Detailed information on the results of test were retained in the

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files of Watson Laboratory at the time of transfer of responsibility for this equipment to the Army Air Forces.

3. A more detailed report on the VHF equipments, from a technical viewpoint, is contained in Chapter ~~XXX~~ X.

Phase No. 2 - PROCUREMENT.

1. 20 Control Net Systems (SCS-2)

- A. Military Characteristics recommended by SCTC meeting No. 198-A, 8/15/41 (Exhibit E) and approved by AGO 3rd Indorsement 8/20/41. File AG 413.44 (8/19/41) MC-D.
- B. Directive to purchase in accordance with letter from OCSigO dated 29 May 1941, subject: Air Defense Equipment to Director, Signal Corps Laboratories, Fort Monmouth, New Jersey, based on War Department directive dated 25 February 1941, subject: Equipment for Air Defense and verbal directive as quoted in memorandum of the Secretary of War to the Chief of Supply from the Chief Signal Officer, subject: Procurement of British Types of Equipment for Test and Training Purposes dated 20 February 1941.
- C. Contract W 1077-sc-767 placed with Bendix Radio Corporation for 20 Control Net Systems SCS-2 (100-156 megacycles). File No. 1082-SCL-42. Special Project S-60 was assigned at SCGBL to cover this activity.

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2. 27 Control Net Systems (SCS-3)

- A. Military Characteristics recommended by SCTC meeting No. 198-A, 8/15/41 (Exhibit D) and approved by AGO 3rd Indorsement 8/20/41. File AG 413.44.
- B. Verbal directive from OCSigO on 1 October 1941 resulted in the execution of a letter contract calling for 27 Control Net Systems SCS-3. Said letter contract was approved by the Acting Chief Signal Officer, 9 October 1941; approved by the Under Secretary of War, 10 October 1941; ~~approved by the Under Secretary of War, 10 October 1941~~; signed by the Contracting Officer, 13 October 1941 and accepted by the Contractor (Bendix Radio Division of the Bendix Aviation Corporation), 17 October 1941. Written confirmation of the verbal approval is contained in paragraph 3 of 1st Indorsement from OCSigO, Washington, D. C., dated 5 December 1941 to Director, Signal Corps Laboratories, Fort Monmouth, New Jersey, file OCSigO 413.44 (VHF), on basic letter of 16 October 1941, subject: Procurement of Control Net System SCS-3 to OCSigO from Director, Signal Corps Laboratories, file FM(SCL)S-61.
- C. Contract W 1077 sc-849 placed with Bendix Radio Corporation for 27 Control Net Systems SCS-3 (100-156 megacycles). File No. 2406-SCL-42. Special Project S-61 was assigned to SCGBL to cover this activity.

3. 93 Control Net Systems (SCS-3)

- A. Military Characteristics recommended by SCTC meeting No. 198-A, 8/15/41 (Exhibit D) and approved by AGO

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Phase No. 2 - PROCUREMENT (Contd.)

3. 93 Control Net Systems (SCS-3) (Contd.)

- D. 3rd Indorsement, 8/20/41 file AG 413.44.
- B. Authority for Procurement - DP No. 43-S-90 dated 9 September 1942 to Director, Signal Corps General Development Laboratory, Fort Monmouth, New Jersey.
- C. Contract W 1077 sc-1179 placed with Bendix Radio Corporation for 93 Control Net Systems SCS-3 (100-156 megacycles), with necessary equipment. File 11960-SCL-42. Special Project S-61-1 was assigned at SCGDL to cover this activity.

4. 125 Control Net Systems (Modified)

- A. Directive received by SCGDL in letter from OCSigO dated 4 February 1942, file OCSigO 413.44 (VHF), subject: Procurement of Mobile VHF Radio Equipment for Defense Aid Purposes (Defense Aid Requisition No. 7134).
- B. Contract W 2281 sc-3 placed with Bendix Radio Corporation for 125 Control Net Systems SCS-3 (modified - comprising, Transmitter - SCR-573; Receiver SCR-574; Direction Finder - SCR-575). File No. 3 SCGDL-42. Project S-63 was assigned at SCGDL to cover this activity.

5. 360 Radio Set SCR-573 (Transmitter Component of SCS-3 System)

- A. Authority for Procurement - DP No. 42-S-124 dated 13 June 1942 to Director, Signal Corps General Development Laboratory, Fort Monmouth, New Jersey.
- B. Contract W 2281 sc-53 placed with Bendix Radio Corporation for 360 Radio Sets SCR-573 (Transmitter Component of SCS-3 System). File 1658-SCGDL-42.

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Phase No. 2 - PROCUREMENT (Contd)

6. 360 Radio Set SCR-574 (Receiver Component of SCS-3 System)
 - A. Authority for Procurement - DP No. 42-S-125 dated 13 June 1942 to Director, Signal Corps General Development Laboratory, Fort Monmouth, New Jersey.
 - B. Contract W 2281 sc-54 placed with Bendix Radio Corporation for 360 Radio Sets SCR-574 (Receiver Component of SCS-3 System). File 1659-SCGDL-42.
7. 400 Radio Set SCR-575 (Direction Finding Component of SCS-3 System)
 - A. Authority for Procurement - DP No. 42-S-126 dated 13 June 1942 to Director, Signal Corps General Development Laboratory, Fort Monmouth, New Jersey.
 - B. Contract W 2281 sc-55 placed with Bendix Radio Corporation for 400 Radio Sets SCR-575 (Direction Finding Component of SCS-3 System). File 1660-SCGDL-42.

Phase No. 3 - INSTALLATION

1. The authority for the installation of VHF equipment is contained in letter from the Office of the Chief Signal Officer, subject: VHF Installation, dated 25 March 1942, file OCSigO 413.44, to the Director, Signal Corps General Development Laboratory charging Laboratory with supplying and training personnel for installing all radio components of subject equipment; and for furnishing technical advisors on exact siting, to immediately handle an estimated peak load of 25 installations. Upon directive from OCSigO these VHF Installation crews would be assigned to appropriate Signal Officers in any part of the world where Signal Corps is called upon to install subject equipment.

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Phase No. 3 - INSTALLATION

2. Before the actual installations were completed the following functions were performed:

- A. Sites Surveyed
- B. Sites Selected
- C. Site Installation - Project Engineering

A. SITE-SURVEY

These surveys were authorized for the purpose of selecting suitable sites for the components of Control Net System SCS-2 and SCS-3 taking into consideration the radio technical requirements, accessible roads, available power facilities and available communication lines with the thought that considerable time and effort would be saved should the need suddenly arise for the installation of these systems in the areas surveyed. These surveys would be of importance to the various interceptor commands concerned. As reports resulting from these general surveys were submitted, copies were furnished to the Commanding General, Army Air Forces and to the Signal Officers of the Interceptor Commands involved to have for such use as may be necessary in connection with the installation of specific systems. To accomplish the above mission contracts were authorized in accordance with directive dated 29 May 1942 from the Office of the Chief Signal Officer authorizing surveys of Atlantic, Pacific and Gulf Coasts and transferring \$490,000.00 for the work, file SPSMA 413.44.

Contracts were placed with the following:

Don Lee Broadcasting Company - Contract W 1077 sc-1264

Pacific Coast from Bakerfield, California to the Mexican Border.

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Phase No. 3 - INSTALLATION (Contd)

A. SITE-SURVEY (Contd)

Raymond M. Wilmette - Contract W 1077 sc-1357 Atlantic Coast
from Norfolk, Virginia to the Canadian Border.

Gille Brothers - Contract W 1077 sc-1378 Pacific Coast from
Bakersfield to the Canadian Border.

G. C. Davis - Contract W 1077 sc-1423 Atlantic Coast from
Norfolk, Virginia (exclusive), South around the
southern tip of Florida to Cedar Keys.

J. G. Wray & Company - Contract W 1077 sc-1451 Gulf Coast
from Cedar Keys, Florida to Mexican Border on the
west.

New contracts were placed as follows for the continuance of
the surveys.

Raymond M. Wilmette - Contract W 2281 sc-413 File No. 6477-
SCGDL-43.

Gille Brothers - Contract W 2281 sc-415 File No. 6500-SCGDL-43.

G. C. Davis - Contract W 2281 sc-418 File No. 6616-SCGDL-43.

J. G. Wray & Company - Contract W 2281 sc-502 File No. 9170-
SCGDL-43.

B. SITE-SELECTION

Selection of sites and priority of installation for Control
Net System SGS-2 and SCS-3 is the responsibility of the Chief, Army Air
Forces. This responsibility was delegated to the Site Board. Reference is
made to 1st Indorsement from War Department, Office of the Chief Signal
Officer to the Director, Signal Corps General Development Laboratory, Fort
Monmouth, New Jersey dated 23 February 1942 on letter dated 1 December 1941,
subject: Sites for Control Net System SCS-2, file FM(SCL) Proj. 12-5.1.

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Phase No. 3 - INSTALLATION (Contd)

B. SITE-SELECTION (Contd)

It was also recommended that the Site Board should consist of members of the following: Corps Area Signal Officer, Corps of Engineers; Plant Division - Army Air Forces and Signal Corps General Development Laboratory.

In the selection of a site for a VHF sector the sites must be determined taking into consideration the operation of Transmitting Station, Receiving Station, Homing D. F. Station, Mobile D. F. Vehicle for Z. Z. landings, three or more Fixer Stations, mobile and non-mobile Relay Stations. The Chief technical consideration when wiring VHF Stations is that VHF propagation is approximately along an optical path, rising ground, high buildings, etc., will have a more or less serious screening effect. The sites selected should, therefore, be on the highest possible ground compatible with the operations and administrative requirements.

The exact siting was the responsibility of the Army Air Forces and in order to determine the exact sites for the components of the SCS-2 system in most cases the technical assistance from other branches was recommended. Normally, after the Army Air Forces temporarily selected a site, the Survey Group of the VHF Section of the Signal Corps General Development Laboratory would make all necessary tests required for the temporarily selected site. In conjunction with the reports of the surveys of the various contractors and the reports of the VHF Survey group in conjunction with the various members of the Site Board the actual site would then be selected and determined by the Army Air Forces.

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Phase No. 3 - INSTALLATION (Contd)

B. SITE-SELECTION (Contd)

Siting:

Following is a list of directives received reference to

Radiogram dated 5 May 1942 from OCSigO requesting VHF Installation and Siting personnel be sent to Commanding General Taylor "Trigger".

Letter from OCSigO, subject: Installation of SCS-2 Control Net Systems, dated 9 July 1942, file SPSMA

413.44 VHF Inst. states now siting will be done by a Tactical Liaison Group operating under control of Commanding General, Army Air Forces and acting for War Department.

A representative from OCSigO and Engineering Service Section, Signal Corps General Development Laboratory will serve on Group. The VHF Section, Installation and Maintenance Branch, OCSigO will furnish shipping instructions for components. Engineering Service Section, Signal Corps General Development Laboratory will furnish crews to various Corps Areas and Department Signal Officers, however, size and makeup of crew to be specified for each installation. These plans to be carried out until Air Service Command is prepared to take over the responsibility.

1st Indorsement from OCSigO dated 23 February 1942, file OCSigO 413.44 (VHF Installation) to Director, Signal Corps General Laboratory, Fort Monmouth, Red Bank, New Jersey on basic letter dated 1 December 1941, file, FM(SCL) Proj.

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Phase No. 3 - INSTALLATION (Contd)

B. SITE SELECTION (CONTD)

12-5.1, subject: Sites for Control Net System SCS-2, to Chief Signal Officer, Washington, D. C. from Director, Signal Corps Laboratories states that the selection of sites and priority of installations is held to be the responsibility of the Chief of Army Air Forces. When this information becomes available arrangements will be made by the Plant Division of this office to carry out preliminary surveys and installation of the systems. The Laboratories will not be responsible for the selection of sites but information and recommendations may be asked of them in connection with certain aspects of siting and installation.

C. SITE - INSTALLATION - PROJECT ENGINEERING

Upon the final selection by the Army Air Forces of a particular site, the Survey Group and the Project Engineering Group of the VHF Section, Signal Corps General Development Laboratory would again make necessary surveys for required formulated project engineering plans, recommended any additional material required and the utilization of existing communication lines to be coordinated through Service Command Signal Officer and acquisition of land to be coordinated through the Corps of Engineers. Upon completion of the project engineering the installation crews would then be sent for the final installation of material required for the operation of a Net Control System.

The above procedure was followed until directive dated

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Phase No. 3 - INSTALLATION (Contd)

C. SITE - INSTALLATION - PROJECT ENGINEERING (Contd)

12 November 1942, file SPSAR 413.44 (VHF Inst), from Office of the Chief Signal Officer, subject: Responsibility for Project Engineering for Installation of Fighter Control System (SCS-2 and SCS-3 Control Net System), to the Director, Signal Corps General Development Laboratory, Fort Monmouth, New Jersey, was received.

This directive stated that the Signal Corps General Development Laboratory would assume, not later than 1 December 1942, the responsibility for the job or project engineering work which will be required in connection with the installation of the Fighter Control equipment (SCS-2 and SCS-3 Control Net Systems). The Project Engineering work described in detail in above directive involves the following functions: After receipt and review of projects prepared in the field and duly approved by the Commanding General, Army Air Forces, and the Chief Signal Officer:

- (1) VHF Prepare all Drawings and Written Instructions Required by the Installers for each Specific Installation.
- (2) Plan and Recommend Procurement on Release from Stock of Supplementary Items.
- (3) Forward Completely Engineered Job through OCSigO and Director of Communications, AAF, to the Air Service Command for Action Relative to Installation.
- (4) Maintain Close Liaison with Air Service Command through Chief Signal Officer on all Installation Matters.
- (5) Prepare to Furnish Qualified Officers or Engineers for Field Problems. Furnish Progress Reports.

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Phase No. 3 - INSTALLATION (Contd)

C. SITE - INSTALLATION - PROJECT ENGINEERING (Contd)

Subject letter also stated that details of allotment of funds for procurement of supplementary equipment was to be worked out. The Signal Corps General Development Laboratory was directed to immediately prepare plans for transfer of personnel in the VHF Section-plan on training civilians in installation however.

List of Directives pertaining to above are as follows;

- (1) Letter from Office of the Chief Signal Officer dated 23 March 1942, file OCSigO 413.44 (VHF Installation.), subject: Installation of Control Net System SCS-2, to Signal Officer, Third Corps Area, Baltimore, Maryland. Letter explained that Control Net Systems SCS-2 were being provided for use by the Air Forces; in accordance with AR-105-20 and Office Regulations of the Chief Signal Officer No. 25.311 and 25.312 installation of equipment should be accomplished. Under these regulations the Radar Division of the Office of the Chief Signal Officer is charged with the staff supervision of the installation for the SCS-2 System and would carry out this supervision through agencies of the OCSigO, who are actually charged with the responsibilities for the installation.
- (2) Radiogram dated 5 May 1942 from OCSigO requesting VHF Installation and Siting personnel be sent to Commanding General Taylor "Trigger."

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Phase No. 3 - INSTALLATION (Contd)

C. SITE-INSTALLATION - PROJECT ENGINEERING (Contd)

- (3) Letter from Office of the Chief Signal Officer dated 31 August 1942, file SPSMA 413.44 (VHF Installation), subject: Transfers of VHF Installation Personnel for Temporary Duty at Field Locations. This letter transfers personnel on temporary duty as follows:

- 4 - Commanding General, 9th Service Command,
Salt Lake City, Utah
(Duty with Service Command Signal Officer)
- 10 - Signal Officer, 4th Fighter Command,
Oakland, California
- 12 - Signal Officer, Panama Canal Dept.,
Quarry Heights, Canal Zone
- 12 - Signal Officer, Hawaiian Dept.,
Fort Shafter, Territory of Haw.

- (4) Letter from Office of the Chief Signal Officer dated 7 September 1942, file SPSMA 413.44 (VHF Installation), subject: Transfers of VHF Installation Personnel for Temporary Duty at Field Locations, to Director, Signal Corps General Development Laboratory. This letter requests that one crew be transferred on temporary duty to Officer in Charge, Alaska Communication System, Seattle, Washington for duty in Anchorage, Alaska.

- (5) Letter to Commanding General, Air Service Command, dated 24 October 1942, file, AFTSC/RI-3, subject: Responsibility and Functions of Air Service Command

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Phase No. 3 - INSTALLATION (Contd)

C. SITE INSTALLATION - PROJECT ENGINEERING (Contd)

- (5) for the Supply, Installation and Maintenance of Communication and Radar Equipment for the Army Air Forces, from Colonel A. W. Marriner, Air Corps, Director of Communications. This letter gives the responsibility for the Supply, Installation and Maintenance of Communication and Radar Equipment for the Army Air Forces to the Air Service Command and lists in detail the functions of the Air Service Command within the continental limits of the United States.
- (6) Letter from Office of the Chief Signal Officer, dated 5 December 1942, file SPSET-2, subject: Installation of Fighter Control Systems, SCS-2 and SCS-3, to the Commanding General of First, Second, Third, Fourth, Fifth, Sixth, Seventh, Eighth and Northwest Service Commands. This letter explained that the responsibility for the installation of all communication equipment of Fighter Control Systems SCS-2 and SCS-3 has been transferred from the Commanding General, Services of Supply to the Commanding General, Army Air Forces, who delegated this responsibility to the Air Service Command. Also explained that the Commanding General, Services of Supply desires that the Service Commands cooperate and render all possible assistance to the Air Service Command in matters connected with the installation of subject equipment.

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Phase No. 3 - INSTALLATION (Contd)

C. SITE-INSTALLATION - PROJECT ENGINEERING (Contd)

- (7) Letter from the Office of the Chief Signal Officer, dated 5 December 1942, file SPSEO 413.44 (SCS-2 and 3), subject: Installation of Fighter Control Systems, SCS-2 and SCS-3. Letter addressed to Commanding General, Ninth Service Command and in addition to explaining that the responsibility for the installation of all communication equipment of Fighter Control Systems SCS-2 and SCS-3 has been transferred from the Commanding General, Services of Supply to the Commanding General, Army Air Forces, who delegated this responsibility to the Air Service Command and requesting all possible assistance from the Service Command to the Air Service Command, requested that a conference be held with representatives of the Signal Section, Air Service Command, Patterson Field, Fairfield, Ohio and arrange for assumption of this responsibility by the Air Service Command. (This conference was held 7 January 1943).

Phase No. 4 - GENERAL DESCRIPTION OF VHF EQUIPMENT

1. Description of the VHF equipment is contained in attached manual entitled Tactical and Technical Manual VHF SCS-2.

Phase No. 5 - For the tactical and technical operations of the VHF equipment see attached manual entitled Tactical and Technical Manual VHF SCS-2.

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Plans for transfer of above functions and necessary personnel were outlined in letter dated 13 February 1943 from Office of the Chief Signal Officer, Aircraft Radio Branch, file SPSAR 413.44 (VHF Inst) to the Director, Signal Corps Ground Signal Service, Bradley Beach, New Jersey, subject: Plans for Transfer of VHF Installation Personnel to the Air Service Command. These plans were carried out and the effective date of transfer was 1 April 1943 as directed by Teletypegram of 31 March 1943 from Office of the Chief Signal Officer

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CONTROL NET SYSTEM SCS-2
(Semi-fixed VHF Interceptor Pursuit Control System SCS-2)

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